CLAIMS

What is claimed is:

1. A glucose and fructose biopolymer obtained from a *Lactococcus lactis* strain (NRRL B-30656) metabolism products.
2. The biopolymer of claim 1 wherein the metabolism products comprise enzyme extracts having glucosyltransferase and fructosyltransferase activity.
3. The biopolymer of claim 1 having a composition maintaining a 0.2 to 0.7 glucose/fructose ratio.
4. The biopolymer according of claims 1 to 3 characterised by presenting the following properties:

    - 900-11,000 Kilodalton molecular weight;
    - two glass transition points; the first between 20°C and 30°C and the second between 190°C and 220°C;
    - stability in aqueous solutions, pH values ranging from 2 to 9;
    - 1,000 to 3,000 centipoises viscosity when the polymer was at 10% to 20% concentration in an aqueous solution at 30°C;
    - non-hygroscopic; and
    - highly soluble in water, able to form hydrogel homogeneous dispersions at maximum 50% weight/volume concentration.

5. A method for producing enzymes having glucosyltransferase and fructosyltransferase activity, produced by *Lactococcus lactis* strain NRRL B-30656, consisting of:
   a) Activating the *Lactococcus lactis* NRRL B-30656r microorganism, using a medium containing sugars as carbon source, proteins as nitrogen source and mineral salts.
   b) Fermenting the *Lactococcus lactis* NRRL B-30656 microorganism using a culture medium containing sugars as carbon source, proteins as nitrogen source and mineral salts.
   c) Separating the enzyme extract from the fermented medium using centrifugation or ultrafiltration.

6. The method for enzyme production according to claim 5, wherein the microorganism activating step is carried out by inoculating a medium containing sucrose as carbon source (molasses, strong wine, sucrose, and other sugary sources), proteins as nitrogen source (yeast extract, ammonium sulphate, meat extract and other nitrogen sources) and mineral salts, which is incubated for 10-36 hours at 25°C, at 100-400 rpm and 5 to 9 pH.
7. The method according to claim 5, where the microorganism fermenting step is carried out by cultivating the *Lactococcus lactis* NRRL B-30656 microorganism using a culture medium containing sucrose as carbon source (molasses, strong wine, sucrose, and other sugary sources), proteins as nitrogen source (yeast extract, ammonium sulphate, meat

extract and other nitrogen sources) and mineral salts , which is incubated for 12-36 hours at 25°C, at 100-400 rpm, 1-2 vvm and pH 5 to 9.

8. The method according to claim 5, wherein the enzyme separating step is carried out by separating the enzyme from the fermented medium by centrifuging the microorganism suspension at 3,000 to 7,000 rpm or by ultrafiltration, using a 0.22 to 0.45 micron membrane.
9. The method for enzyme production according to claim 5, wherein the fermentation step with the microorganism can be done by making a preinoculum with the *Lactococcus lactis* NRRL B-30656 microorganism using a culture medium containing sugars as carbon source (molasses, strong wine, sucrose, and other sugary sources), proteins as nitrogen source (yeast extract, ammonium sulphate, meat extract and other nitrogen sources) and mineral salts, which is incubated for 12-36 hours at 25°C, at 100-400 rpm, 1-2 vvm and pH 5 to 9.
10. The method for enzyme production having transferase activity according to claims 2, 5 to 8, consisting of:
    a. Activating the *Lactococcus lactis* NRRL B-30656 microorganism, inoculating a medium containing sucrose as carbon source (molasses, strong wine, sucrose, and other sugary sources) 10 – 40 g/l concentrations, proteins as nitrogen source (yeast extract, ammonium sulphate, meat extract and other nitrogen sources) 7 – 30 g/l concentration and mineral salts, which is incubated for 10 – 36 hours, agitation 100 – 400 rpm and pH 5 - 9.

b. Making a preinoculum with *Lactococcus lactis* NRRL B-30656 microorganism using medium containing sucrose as carbon source (molasses, strong wine, sucrose, and other sugary sources) proteins as nitrogen source (yeast extract, ammonium sulphate, meat extract and other nitrogen sources) and mineral salts, this medium is incubated for 10 – 36 hours, 25 °C, agitation 100 – 400 rpm, 1 – 2 vvm and pH 5 - 9.

c. Culturing the *Lactococcus lactis* NRRL B-30656 microorganism using a culture medium containing sugars as carbon source (molasses, strong wine, sucrose, and other sugary sources), proteins as nitrogen source (yeast extract, ammonium sulphate, meat extract and other nitrogen sources) and mineral salts, K_2HPO_4, $FeSO_4.7H_2O$, $MgSO_4.7H_2O$, $MnSO_4.H_2O$, $CaCl_2.2H_2O$ and NaCl which is incubated for 12-36 hours at 25°C, at 100-400 rpm, 1-2 vvm and pH 5 to 9.

d. Separating the enzyme from the fermented medium by centrifuging the microorganism suspension at 3000 to 7000 rpm or by ultrafiltration, using a 0.22 to 0.45 micra membrane.

11. The method for producing a glucose and fructose polymer according to claim 1, comprises:

a) Incubating the transferase enzyme, obtained by fermentation according to claim 10, in a medium containing sugar sources, under suitable conditions of stirring, temperature, pH, enzyme and substrate concentration and reaction time for producing the biopolymer.

b) Recovering and purifying the biopolymer by precipitation or ultrafiltration.

12. The method for producing the biopolymer , according to claim 10, where the enzyme incubation step comprises:

    Incubating the enzyme in a medium containing sugar sources (strong wines, molasses, sucrose), under suitable stirring (100-400 rpm), temperature, pH (5 a 9), enzyme (10-40% v/v enzymatic extract) and substrate concentration (5-40%) and reaction time (12-48 hours) conditions for producing the biopolymer.

13. The method according to claim 10 where the biopolymer recovery and purification by precipitation step comprises:

    - Adding 1.2-2.0 volumes of 96% ethanol to the cold reaction mixture with stirring (the quantity of added ethanol corresponds to ethanol/reaction mixture volume).
    - Dissolving the precipitated biopolymer in half the volume of deionised and distilled water and precipitating it again with 1.2 to 2.0 volumes of ethanol/reaction mixture volume.
    - Dissolving the precipitated biopolymer in a third of the volume of water and drying by lyophilisation or compressed air drying at 50°C a 80°C until reaching 5-6% humidity.

14. The method according to claim 10 wherein the biopolymer recovery and purification by ultrafiltration step comprisesof carrying out a process of ultrafiltration with the reaction

mixture using a regenerated cellulose membrane having a pore size greater than 10,000-30,000 Dalton to eliminate residual glucose and fructose and submitting the biopolymer to aspersion drying.

15. A *Lactococcus lactis* strain microorganism isolated from Colombian soil, registered and having been assigned accession number NRRL B-30656.

16. A microorganism according to claim 14 characterized by producing the enzyme extract having glucosyltransferase and fructosyltransferase activity.

17. A microorganism according to claim 14 characterized by producing the biopolymer according to claims 1 and 4.

18. A method for the conservation of the microorganism according to any one of claims 14 to 16, consisting in the lyophilisation of the microorganism, characterized in that it comprises:

    a) Culturing the microorganism in sucrose brothat 25 – 35 °C for 12 – 24 hours.

    b) Distributing the culture in 1 ml centrifuge tubs, with 10 to 20% v/v of sterile free fat milk,

    c) Lyophilising the culture.

19. A method for the conservation of the microorganism according to claims 14 to 16, comprinig freezing the microorganism, according with the following steps:

    a) Culturing the microorganism in a sucrose broth at 25 – 35 °C for 12 – 24 hours.

    b) Distributing the culture in 1 ml centrifuge tubs, with 20% v/v of glycerol and storing at -70°C.

20. The biopolymer according to any one of claims 1 to 4, used in the farmaceutical industry as thickener, viscous agent, stabiliser, dispersant, film former, desintegrant, blood plasma substitute, lubricating agent and prebiotic agent.

21. The biopolymer according to any one of the claims 1 to 4 used in food industry as thickener, viscous agent, stabiliser, dispersant, fibre, fat and oil substitute and ether- and ester-based carbohydrate.

22. The biopolymer according to any one of the claims 1 to 4 used in products obtained by extrusion, to form biodegradable films for producing biodegradable, flexible packages and for obtaining disposable biodegradable products, obtained by injection or molding, and in the production of flocculant agents for water treatment.